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I. Related Applications

This application claims the benefit of U.S. Provisional Patent Application No. 60/152,194, filed August 31, 1999, which is herein incorporated by reference.

II. Background of the Invention

A. Field of the Invention

The present invention relates to apparatus and methods for identifying and processing mail. More particularly, the present invention relates to apparatus and methods for using an identification code on a mailpiece as a redundant source of identification for identifying and processing the mailpiece in a mail sorting system.

B. Description of the Related Art

Conventional systems for identifying and processing (e.g., sorting) mail require both human and mechanical operations. Human operations are initially required to load the mail from a mail delivery repository into a mechanical identification and processing system. Mechanical operations then attempt to identify the delivery address for each mailpiece and, if successful, to then process each mailpiece based on the delivery address. Processing a mailpiece can be, for example, sorting the mailpiece. If there is a failure to identify the delivery address of a mailpiece mechanically, human operators are required again to identify the delivery address. Likewise, if there is a failure to process the mailpiece based on the delivery address, human operators are also required again to process the mailpiece. Therefore, conventional systems for

identifying and processing mail are dependent upon human operators, if the mechanical systems are unable to identify or process a mailpiece.

To identify mail with the conventional systems, mail is loaded into a mechanical identification system, which automatically feeds each mailpiece into an optical character reader (OCR) machine. The OCR machine then attempts to "electronically read" the delivery address from the mailpiece in order to place the delivery address in a computer. If the OCR machine cannot read the delivery address (e.g., the ZIP code), the mechanical device rejects the mailpiece. The rejected mailpiece may then be fed into another mechanical device, which presents the mailpiece to a human operator, who "physically reads" the delivery address off the mailpiece and key punches the delivery address into a computer. Once the delivery address has been either electronically or physically read and placed into a computer, the computer prints the delivery address on the mailpiece, using a special code (e.g., a bar code, such as, a POSTNET code).

To process mail with the conventional systems, mail is loaded into a mechanical processing system, which automatically sorts each mailpiece by the destination address. The majority of conventional mechanical processing systems sort each mailpiece based on a special code, such as, a ZIP code or a bar code (i.e., a POSTNET code). These mechanical processing systems may contain an OCR machine, which can read and sort a mailpiece based on the ZIP code. These mechanical processing systems may also contain a Bar Code Sorter, which can read

5 and sort a mailpiece based on the POSTNET code. If the mechanical processing system cannot read either the ZIP code or the POSTNET code, the system rejects the mailpiece. The rejected mailpiece may then be processed by a human operator. The human operator may then determine why the mechanical processing system rejected the mailpiece, solve the problem (e.g., determine the ZIP code or reattach the POSTNET code to the mailpiece), and then reload the mailpiece into the mechanical processing system for processing.

10 To improve upon these conventional systems for identifying and processing mail, the United States Postal Service developed an automated sorting system, described in U.S. Patent No. 4,992,649 (the '649 patent), which is herein incorporated by reference. One embodiment of the system disclosed in the '649 patent is a Remote Bar Code System (RBCS). The embodiment of the RBCS described in the '649 patent provides for the electronic sorting of mail using a bar code that is placed on the front of each mailpiece, known as the POSTNET code, and another bar code that is placed on the back of each mailpiece, known as the ITEM code.

15 In the RBCS, the POSTNET code corresponds to the delivery address for the mailpiece, and the ITEM code corresponds to the mailpiece itself (i.e., the ITEM code is a means to "identify" each particular mailpiece). The POSTNET code represents a copy of the ZIP code in bar code format, and the POSTNET code can be used to route a mailpiece, if the ZIP code cannot be read. The ITEM code represents a unique code in bar code format, and the ITEM code can be used to identify each particular

mailpiece, if the RBCS cannot otherwise identify the mailpiece. For example, in the RBCS, the ITEM code can be linked to an electronic image of the mailpiece taken at the time the mailpiece is marked with the ITEM code by the RBCS. So, if the RBCS cannot identify a mailpiece, the RBCS can recall the electronic image of the mailpiece, which contains a destination address, including the POSTNET code.

The identification and processing of mail in the RBCS is dependent upon the use of either the POSTNET code or the ITEM code. When each mailpiece is identified by the RBCS, the ITEM code is first stored temporarily until the mailpiece receives the POSTNET code and has been processed by the RBCS. If the POSTNET code becomes illegible during processing, the ITEM code may be used to obtain the POSTNET code. The ITEM code is used to store a copy of the POSTNET code in a short-term memory until the RBCS has processed the mailpiece based on the POSTNET code. However, once the mailpiece has been processed and sorted based on the POSTNET code, the RBCS can no longer access the ITEM code, because the RBCS cannot store the ITEM code locally or transmit the ITEM code to other RBCS sites.

As a result, a number of problems can arise if the POSTNET code cannot be read by the RBCS. For instance, the POSTNET code on a mailpiece might be illegible as soon as it is applied due to the color or pattern of the mailpiece. If so, the mailpiece may be fed into a letter mail labeling machine that applies a white label to cover the illegible POSTNET code, and then, the mailpiece may be again fed into the RBCS

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desirable to overcome these shortcomings by developing apparatus and methods to identify and process mail where a redundant identification code is used with a global system for identifying and processing mail, where one or more the nodes of the system are connected via hardware or software.

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III. Summary of the Invention

Apparatus and methods consistent with the present invention overcome the shortcomings of the conventional systems by using an identification code on the back of each mailpiece as a redundant source of identification for identifying and processing mail in a mail sorting system.

Apparatus and methods consistent with the present invention process mailpiece information using a primary identification code server. The primary identification code server receives an identification file containing an identification code and a postal code corresponding to a mailpiece. The primary identification code server then resolves mailpiece information for a mail processing device, using the identification file. The primary identification code server may update a secondary identification code server using the identification file so that the secondary identification code server can resolve mailpiece information for a mail processing device, using the identification file.

Additional objects and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention will

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be realized and attained by means of the elements and combinations particularly pointed out in the appended claims.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

IV. Brief Description of the Drawings

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate several embodiments of the invention and, together with the description, serve to explain the principles of the invention.

In the drawings:

Figure 1 illustrates a simplified overview of the initial components or steps in apparatus or methods for identifying and processing a mailpiece consistent with the present invention;

Figures 2A and 2B illustrate embodiments of a mailpiece, consistent with apparatus or methods for identifying and processing mail consistent with one embodiment of the present invention;

Figure 3 shows an embodiment of an ID Tag in greater detail, as shown in Figure 2B;

Figure 4A depicts a simplified overview of a mailpiece as it enters a Post Office in a Remote Bar Code System (RBCS);

Figure 4B depicts a simplified overview of a mailpiece as it enters a Post Office in an Identification Code Sorting (ICS) system;

Figure 5 shows one embodiment of a Remote Bar Code System (RBCS), as shown in Figure 2A and 4A;

Figure 6A shows one embodiment of an Identification Code Sorting (ICS) system, as shown in Figures 2A and 4B;

Figure 6B shows an alternative embodiment of an Identification Code Sorting (ICS) system, as shown in Figures 2A and 4B;

Figure 7 is a detailed view of one embodiment of the section of an ICS system in which a mailpiece image (including an ID Tag) is processed to determine a POSTNET code (or ZIP code) corresponding to the destination address of a mailpiece, as shown in Figure 6A;

Figure 8 is a block diagram of one embodiment of an Image Control Unit (ICU) in greater detail;

Figure 9 is a block diagram of one embodiment of a Remote Computer Reader (RCR) in greater detail;

Figure 10 is a block diagram of one embodiment of an Image Buffer in greater detail;

Figure 11 is a block diagram of one embodiment of a Keying Site in greater detail;

Figure 12 is a block diagram of one embodiment of a Primary Identification Code Server/Secondary Identification Code Server (PICS/SICS) system, as shown in Figures 6A and 6B;

Figure 13 is a block diagram of one embodiment of a Primary Identification Code Server (PICS), as shown in Figure 12;

Figure 14 shows one embodiment of how a PICS functions, as shown in Figure 13;

Figure 15 is a block diagram of one embodiment of a Secondary Identification Code Server (SICS), as shown in Figure 14;

Figure 15A is a diagram of one embodiment of a plurality of Primary Identification Code Servers operating in national mode;

Figure 15B illustrates one embodiment of a process by which the sharing of mailpiece identification files takes place in national mode, as shown in Figure 15A;

Figure 16 depicts one embodiment of a PICS/SICS system incorporating Common Sorter Software;

Figure 17 is a block diagram of one embodiment of a Bar Code Sorter (BCS) system using Common Sorter Software to connect to a PICS;

Figure 18 illustrates various embodiments of Bar Code Sorters using Common Sorter Software to connect to a PICS/SICS such as the BCS systems shown in Figure 17;

Figures 19A-19C illustrate one embodiment for a process used by one embodiment of Common Sorter Software during the identification and processing of a mailpiece by any of the Bar Code Sorters (BCS), such as those shown in Figure 18;

Figure 20 is a block diagram of a Bar Code Sorter (BCS) consistent with one embodiment of the present invention, for example, as used by a RBCS, which includes, for example, an RBCS ID Tag Reader;

Figure 21 is a block diagram of a Bar Code Sorter (BCS) consistent with one embodiment of the present invention, for example, as used by an ICS system, which includes, for example, a Universal ID Tag Reader;

Figure 22 is a block diagram of one embodiment of a Universal ID Tag Reader (UIDTR);

Figure 23 illustrates one embodiment of a UIDTR in greater detail, as shown in Figure 22;

Figures 24A-24D illustrate the operation of one embodiment of a UIDTR while processing a mailpiece, according to one embodiment of the invention;

Figure 25 shows optional components of an embodiment of a UIDTR such as the UIDTR in Figure 22; and

Figure 26 shows still additional optional components of another embodiment of a UIDTR, such as the UIDTR in Figure 22.

V. Detailed Description

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A. Introduction

Apparatus and methods consistent with the present invention provide for identifying and processing mail using an identification code on a mailpiece as a redundant source of identification information in a mail sorting system. In one embodiment, this information is stored in a temporary database and used for the identification and processing of mail in a Remote Bar Code System (RBCS). In this embodiment, the identification code enables the automation of mail sorting and other processing tasks, reducing costs and delays in mail delivery services. In another embodiment, the identification and processing of mail occurs in an Identification Code Sorting (ICS) system. In this embodiment, a long-term database allows for mail sorting and other processing tasks on a national or global level.

Reference will now be made in detail to various embodiments of the invention, examples of which are illustrated in the accompanying drawings. Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the appended claims.

B. Overview of a System for Identifying and Processing Mail

Figure 1 illustrates a simplified overview of the initial components or steps in apparatus or methods for identifying and processing a mailpiece consistent with the present invention. In Figure 1, a mailpiece 100 is delivered by a postal customer 102 to

5 a Post Office 104. Mailpiece 100 can be, for example, a letter or a package that postal customer 102 wishes to send to a destination address. To do so, postal customer 102 marks mailpiece 100 with a destination address and delivers it to Post Office 104. Post Office 104 can be a United States Postal Service (USPS) Post Office, a USPS mailbox, or any other facility or location capable of receiving a mailpiece or other item for delivery to a destination address using a system for identifying and processing mail.

1. POSTNET Code

10 Figures 2A and 2B illustrate embodiments of a mailpiece, consistent with apparatus or methods for identifying and processing mail consistent with one embodiment of the present invention. As shown in Figure 2A, mailpiece 100 contains two sources of delivery information, a destination address 200 and a POSTNET code 202 corresponding to destination address 200. For example, POSTNET code 202 can correspond to the ZIP code portion of destination address 200. POSTNET code 202 can be placed on mailpiece 100 by postal customer 102 or by the USPS at a processing center, e.g., Post Office 104. In systems consistent with apparatus or methods for identifying and processing mail consistent with one embodiment of the present invention, POSTNET code 202 can be read and used to route mailpiece 100 to a delivery facility, such as a Post Office, corresponding to destination address 200 for the delivery information. Therefore, if destination address 200 is illegible, POSTNET code 202 provides an alternative source of delivery information.

2. Identification Tag (ID Tag)

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Tag 204 can be used in ICS system 600 at any time during the processing of mailpiece 100 from Post Office 104 to the destination address.

Consistent with one embodiment of the present invention, ICS system 600 utilizes computer hardware and software to maintain a long-term database for a plurality of ID Tags 204. In ICS system 600, if POSTNET code 202 becomes illegible, ID Tag 204 provides a source by which mailpiece 100 can be automatically identified and processed in ICS system 600 throughout the entire mail identification and processing system, whereby ICS system 600 references a long-term database stored within ICS system 600. In addition, ICS system 600 also enables many advanced processing capabilities based on ID Tag 204, including, for example, redundant ZIP code confirmation.

3. Detailed Description of RBCS

Figure 5 shows one embodiment of a Remote Bar Code System (RBCS), as shown in Figure 2A and 4A. When mailpiece 100 with destination address 200 enters Post Office 104 using RBCS 500, as shown in Figures 2A and 4A, processing begins at an Input Subsystem (ISS) 502. A piece of equipment at ISS 502, such as a MultiLine Optical Character Reader Input Subsystem, sprays (i.e., prints) ID Tag 204 onto the back of mailpiece 100 using, for example, fluorescent ink. ISS 502 also takes an image of mailpiece 100 (e.g., a digital image) and attempts to resolve the ZIP code portion of destination address 200, that is, ISS 502 attempts to determine POSTNET code 202 in sufficient detail to enable delivery of mailpiece 100 to destination address 200.

Sufficient detail may be, for example, a ZIP code with 5, 9, or 11 digits. If ISS 502 successfully resolves the ZIP code portion of destination address 200, ISS 502 then also sprays POSTNET code 202 corresponding to destination address 200 onto the front of mailpiece 100, for example, using nonfluorescent ink. Once RBCS 500 has affixed ID Tag 204 and POSTNET code 202 to mailpiece 100, ISS 502 then sends the POSTNET code information from POSTNET code 202 and the ID Tag information from ID Tag 204 to Image Control Unit (ICU) 508, where the POSTNET code information from POSTNET code 202 and the ID Tag information from ID Tag 204 is stored in Decision Storage Unit (DSU) 514.

If ISS 502 can resolve the ZIP code from destination address 200, and obtain POSTNET code 202 on mailpiece 100, ISS 502 then verifies POSTNET code 202 to confirm that POSTNET code 202 is legible. POSTNET code 202 may not be legible and may result in a verify error, if, for instance, mailpiece 100 is a color other than white or has a pattern that obscures POSTNET code 202. If ISS 502 cannot verify POSTNET code 202, mailpiece 100 is sent to an Output Subsystem 504 and marked for processing by a Letter Mail Labeling Machine (LMLM) 506. At LMLM 506, a white label is applied over the illegible POSTNET code, and mailpiece 100 is manually fed into OSS 504. The white label creates a clear area on mailpiece 100, and RBCS 500 then reapplies POSTNET code 202 onto the white label on mailpiece 100. OSS 504 then verifies POSTNET code 202 to confirm that POSTNET code 202 is legible. Once POSTNET code 202 is verified, ID Tag 204 has no further use.

If ISS 502 cannot resolve the ZIP code from destination address 200, then the mailpiece image, including ID Tag 204, is sent from ISS 502 to an Image Control Unit (ICU) 508. ICU 508 receives delivery address data from a Central Database 510 and forwards the data along with the mailpiece image, including ID Tag 204, to a Remote Computer Reader (RCR) 512. This delivery address data may include ZIP code data, POSTNET data, or temporary ID Tag files, as described in more detail herein. RCR 512 first attempts to use the data from the central database to automatically resolve the ZIP code corresponding to mailpiece 100. For example, RCR 512 uses ID Tag 204 to determine if there is a temporary file on mailpiece 100 in RBCS 500, which contains the ZIP code data. If RCR 512 is successful, it returns the ZIP code data to ICU 508, where the data is stored in a Decision Storage Unit (DSU) 514. If RCR 512 does not successfully resolve the ZIP code corresponding to mailpiece 100, the mailpiece image, including ID Tag 204, is sent from ICU 508 to a Keying Site 516, where a human operator views the mailpiece image and keys in the ZIP code data, which is returned to ICU 508 and stored in DSU 514. Therefore, in RBCS 500, regardless whether RCR 512 or Keying Site 516 resolves the ZIP code data, the ZIP code data, in the form of POSTNET code 202, is linked to ID Tag 204. All of this information, which is identified by ID Tag 204, is temporarily stored in DSU 514.

If ISS 502 cannot resolve the ZIP code from destination address 200, and while the mailpiece image is processed by ICU 508, mailpiece 100 is routed from ISS 502 to an Output Subsystem (OSS) 504. A Bar Code Sorter at OSS 504 reads ID Tag 204

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fluorescent ink. ISS 602 also takes an image (e.g., a digital image) of mailpiece 100 and attempts to resolve the ZIP code portion of destination address 200. If ISS 602 successfully resolves the ZIP code portion of destination address 200, ISS 602 then sprays POSTNET code 202 corresponding to destination address 200 onto the front of mailpiece 100, for example, using nonfluorescent ink. Once ICS system 600 has affixed ID Tag 204 and POSTNET code 202 to mailpiece 100, ISS 602 then sends the POSTNET code information from POSTNET code 202 and ID Tag information from ID Tag 204 to ICU 608, where the POSTNET code information from POSTNET code 202 and the ID Tag information from ID Tag 204 is stored in DSU 614 and ICS Buffer 616.

If ISS 602 can resolve the ZIP code from destination address 200 and obtain POSTNET code 202 on mailpiece 100, ISS 602 then verifies POSTNET code 202. This may result in a verify error if, for instance, mailpiece 100 is a color other than white or has a pattern that obscures POSTNET code 202. If ISS 602 cannot verify POSTNET code 202, mailpiece 100 is sent to an Output Subsystem (OSS) 604. OSS 604 determines whether mailpiece 100 is bound for an ICS-enabled destination. If mailpiece 100 is bound for an ICS-enabled destination, then mailpiece 100 stays within ICS system 600 and does not require initial manual intervention. Therefore, in contrast to RBCS 500, a letter mail labeling machine is not necessary in ICS system 600. However, if mailpiece 100 is not bound for an ICS-enabled destination, then mailpiece 100 is processed as in RBCS 500, as described above.

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OSS 604. A Bar Code Sorter at OSS 604 reads ID Tag 204 from mailpiece 100 and transmits a lookup request to DSU 614. Once the ZIP code has been resolved for mailpiece 100, DSU 614 then retrieves and returns the ZIP code corresponding to ID Tag 204 to OSS 604, and OSS 604 then applies POSTNET code 202 to mailpiece 100, if necessary. OSS 604 then verifies POSTNET code 202 to confirm that POSTNET code 202 is legible. However, in contrast to RBCS 500, even if OSS 604 cannot verify POSTNET code 202, mailpiece 100 can still be identified and processed in ICS system 600, if OSS 604 determines that mailpiece 100 is bound for an ICS-enabled destination. In this scenario, ICS system 600 simply uses ID Tag 204 as the identification code (instead of POSTNET code 202).

Therefore, in contrast to RBCS 500, ICS system 600 provides for the long-term storage of ID Tags 204 and corresponding POSTNET codes 202, which allows for the automation of tasks previously required to be performed by human operators. In addition, ICS system 600 provides for the sharing of this information throughout all phases of the identification and processing of mailpiece 100. This capability is made possible by Primary Identification Code Server/Secondary Identification Code Server (PICS/SICS) system 622. As described below, PICS/SICS system 622 enables downstream mailpiece identification and processing based on ID Tag 204, even if POSTNET code 202 becomes illegible. As in RBCS 500, after mailpiece 100 is processed by ISS 602 and OSS 604 in ICS system 600, initial mail processing is complete. Thereafter, mailpiece 100 is processed as in RBCS 500, as described above.

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Figure 6B shows an alternative embodiment of an Identification Code Sorting (ICS) system, as shown in Figures 2A and 4B. In this embodiment, if RCR 612 does not successfully resolve the ZIP code corresponding to mailpiece 100, the mailpiece image is not stored in an image buffer (e.g., Image Buffer 618 in Figure 6A). Instead, RCR 612 sends the mailpiece image to ICU 608 indicating that the ZIP code has not been resolved, and ICU 608 transmits the mailpiece image to Keying Site 620. At Keying Site 620, processing occurs as described above with reference to Figure 6A.

a. Overview of Processing for Mailpiece Image

Figure 7 is a detailed view of one embodiment of the section of an ICS system in which a mailpiece image (including an ID Tag) is processed to determine a POSTNET code (or ZIP code) corresponding to the destination address of a mailpiece, as shown in Figure 6A. The mailpiece image (along with ID Tag 204), taken at ISS 602, is passed from ISS 602 to ICU 608 for processing. From ICU 608, the mailpiece image (and ID Tag 204) is passed to RCR 612. Also, Central Database 610 (e.g., a USPS master address database) passes data (e.g., POSTNET data and/or ZIP code data) via ICU 608 to RCR 612. RCR 612 processes the mailpiece image to resolve ZIP code data using the data received from Central Database 610. Generally, RCR 612 is able to resolve ZIP code data based on a file contained within Central Database 610—the file is identified by ID Tag 204. In effect, ID Tag 204 is used to match the mailpiece image to a file in Central Database 610. In ICS system 600, in contrast to RBCS 500, ID Tag

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returns an identification file, including POSTNET code 202, to ICU 608, where it is stored with ID Tag 204 in both DSU 614 and ICS Buffer 616. DSU 614 supplies identification information, such as ID Tag 204 and POSTNET code 202 for mailpiece 100, to OSS 604 during initial mail processing. ICS Buffer 616 retains a copy of this identification information locally for ICS system 600. A copy of ICS Buffer 616 may be sent to Central Database 610 for long-term storage.

Figure 9 is a block diagram of one embodiment of a Remote Computer Reader (RCR) in greater detail. RCR 612 receives the mailpiece image (including ID Tag 204, not shown) and the master reference table from ICU 608, as described above with reference to Figure 8. RCR 612 first attempts to compare the mailpiece image to data in the master reference table to resolve a POSTNET code for the mailpiece (i.e., mailpiece 100) corresponding to the mailpiece image. In doing so, RCR 612 uses ID Tag 204 to determine if there is a file on mailpiece 100, which contains identification information, such as, POSTNET code 202, for mailpiece 100. If RCR 612 succeeds, then RCR 612 sends POSTNET code 202 to ICU 608. If RCR 612 does not resolve the identification information, then, in one embodiment, RCR 612 assigns a priority designation to the mailpiece image and passes the mailpiece image (including ID Tag 204, not shown) and the priority designation to Image Buffer 618. Processing by Image Buffer 618 is described below, with reference to Figure 10. In an alternative embodiment (not shown), if RCR 612 does not resolve the POSTNET code, RCR 612 can send the mailpiece image or data indicating that the identification information has

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information to ICU 608 as an identification file. It is to be understood that a priority designation is not necessary. Alternatively, Keying Site 620 could process mailpiece images on a first-received, first-processed basis, if priority designations are not used.

D. Primary Identification Code Server/Secondary Identification Code Server (PICS/SICS) System

Figure 12 is a block diagram of one embodiment of a Primary Identification Code Server/Secondary Identification Code Server (PICS/SICS) system, as shown in Figures 6A and 6B. As described above in Figures 6A and 6B, ICU 608 maintains ICS Buffer 616, which stores ID Tags and corresponding POSTNET codes for mailpieces. ICU 608 may share this information with PICS/SICS system 622. As shown in Figure 12, ICU 608 shares identification information with a Primary Identification Code Server (PICS) 1200 via a telecommunications connection 1202. PICS 1200 in turn shares the identification information with a Secondary Identification Code Server (SICS) 1204 via a telecommunications connection 1206.

As shown in Figure 12, PICS 1200 can also communicate with a Value Added Service System 1208 via telecommunications link 1210. Value Added Service System 1208 can be, for example, a system to track and report the performance of PICS/SICS system 622. Telecommunications connections 1202, 1206, and 1210 can be, for example, an Internet connection, a telephone line with a modem, a local area network (LAN), or a wide area network (WAN). In systems consistent with the present invention, PICS 1200 can communicate with multiple SICS to share a plurality of identification

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communicates with one or more Bar Code Sorters (BCS) 1302, one or more Secondary Identification Code Servers (SICS) 1304, and one or more PICS. In national mode, PICS 1200 may additionally communicate with PICS 1200 via one or more Electronic Post Offices (EPOs) (not shown). National mode is described below, with reference to Figures 15A and 15B.

As shown in the depicted implementation in Figure 13, to identify information processed between ICU 608 and PICS 1200, PICS 1200 maintains a Lookup Table 1310. Identification files, or ID files, containing ID Tag and POSTNET data, are stored in the identification files in Lookup Table 1310. To serve one or more SICS 1304, PICS 1200 includes a SICS_ZIP Data File Generator 1312 and a SICS Service Area Table Database 1314. SICS_ZIP Data File Generator 1312 is used by PICS 1200 to create a SICS_ZIP Data File (not shown here, but see below) for each SICS connected to PICS 1200 by matching identification files from Lookup Table 1310 to the service area of each SICS. The service area of each SICS connected to PICS 1200, i.e., the geographic area served by each SICS, is stored in a SICS Service Area Table in SICS Service Area Table Database 1314.

Figure 14 shows one embodiment of how a PICS functions, as shown in Figure 13. PICS 1200 receives an identification file, including ID Tag 204 and POSTNET code 202, from ICU 608 via telecommunications link 1202. PICS 1200 stores the identification file in Lookup Table 1310. As shown in Figure 14, each identification file 1420 contains an identification code (ID code) 1422, such as, for example, ID Tag 204,

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and a postal code 1424, such as, for example, POSTNET code 202. In addition, identification file 1420 can include additional information, such as, for example, an image capture time or status bits indicating various aspects of the identification file. PICS 1200 contains SICS_ZIP Data File Generator 1312. SICS_ZIP Data File Generator 1312 is used by PICS 1200 to create a SICS_ZIP Data File 1406 for each SICS connected to PICS 1200 by matching identification files 1420 from Lookup Table 1310 to the service area of each SICS from SICS Service Area Table Database 1314. PICS 1200 maintains SICS Service Area Table Database 1314, which includes a set of SICS Service Area Tables corresponding to each SICS served by PICS 1200. For example, SICS 1404 would have a corresponding SICS Service Area Table 1315 in SICS Service Area Table Database 1314.

In one implementation of ICS system 600, referring to Figure 14, PICS 1200 has two functions. A first function of PICS 1200 is to resolve mailpiece information for Bar Code Sorter (BCS) 1402. To do this, BCS 1402 reads an identification code 1410 from a mailpiece and sends the identification code (or ID code or ID Tag) to PICS 1200, such as, for example, via a dedicated ICS local area network (not shown). PICS 1200 looks up identification code 1410 in Lookup Table 1310, and returns identification information, i.e., the ZIP code or the POSTNET code, corresponding to identification code 1410 to BCS 1402.

To do so, PICS 1200 matches identification code 1410 with an identification code contained in an identification file, such as identification code 1422 in identification

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shown in Figure 15B, in national mode, PICS 1510 collects identification files in Lookup Table 1512, as described above. PICS 1510 then determines which of the identification files in Lookup Table 1512 are served by other PICS/SICS systems using a Local.Sat file 1514, as described above. PICS 1510 maintains an EPO.Sat file 1513 to define what records are to be sent to other PICS via EPOs. In one embodiment, Local.Sat file 1514 can contain a list of all ZIP codes served by PICS 1510 (as well as any SICS connected to PICS 1510). In this embodiment, EPO.Sat file 1513 can be the inverse of Local.Sat file 1514. PICS 1510 can have a National Mode indicator 1511. In national mode, PICS 1510 periodically sends these identification files to a primary EPO 1520 via a network connection (not depicted). PICS 1510 also sends a copy of Local.Sat file 1514 to primary EPO 1520. Local.Sat file 1514 contains a list of all the ZIP codes served by PICS 1510. In one implementation, PICS 1510 may also have a secondary EPO for use in case primary EPO 1520 is unavailable or inoperative (not shown).

Once PICS 1510 has transferred the identification files to EPO 1520, EPO 1520 collects and stores the identification files in a Storage Buffer 1514. EPO 1520 also collects and stores any Local.Sat files 1514 in a plurality of Table Buffers 1516. Each PICS table 1518 in PICS Table Buffer 1516 is created using the Local.Sat files received from the plurality of PICS operating in national mode, such as, PICS 1510. For example, when EPO 1520 receives Local.Sat file 1514 from PICS 1510, EPO 1520 creates a PICS Table 1518 corresponding to PICS 1510. Thereafter, in an implementation based on ZIP codes, as EPO 1520 receives identification files from

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other PICS, EPO 1520 stores the identification files matching the ZIP codes in PICS Table Buffer 1516 in the corresponding PICS Table for each respective PICS (e.g., if the ZIP code matches the ZIP codes in PICS Table 1518 corresponding to Local.Sat file 1514, the identification file is matched to PICS Table 1518). At predetermined intervals (similar to the predetermined intervals described above), EPO 1520 then sends a copy of each PICS Table in PICS Table Buffer 1516 to its corresponding PICS. For example, if EPO 1520 collects identification files corresponding to PICS 1530 into a PICS Table 1519, EPO 1520 may send PICS table 1519 to PICS 1530. Additionally, EPO 1520 may also send a copy of National.Sat file 1515 to PICS 1530. National.Sat file 1515 is a compilation of all Local.Sat files received by EPO 1520. National.Sat file 1518 can be used by EPO 1520 to monitor all areas services by ICS system 600. If a copy is transferred from EPO 1520 to PICS 1530, National.Sat file 1518 can also be used by PICS 1530 to monitor all areas that are served by ICS system 600.

E. Common Sorter Software

As described above, as shown in Figures 12 and 13, both PICS and SICS exchange information with Bar Code Sorters (BCS). For example, PICS 1200 in Figure 13 exchanges information with a plurality of BCS 1302, and a plurality of SICS 1304 exchange information with a plurality of BCS 1306. Throughout ICS system 600, different types of BCS are used to read identification information from a mailpiece and process the mailpiece through a PICS or a SICS. Accordingly, using the same example

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from Figure 13, a common sorter software is needed to allow PICS 1200 and SICS 1304 to exchange information with BCS 1302 and BCS 1306, respectively.

Figure 16 depicts one embodiment of a PICS/SICS system incorporating Common Sorter Software. Common Sorter Software 1602 performs a number of tasks, including, for example, initiating a connection between a BCS and a PICS and/or SICS, transmitting information between the BCS and the PICS and/or SICS, and terminating the connection between the BCS and the PICS and/or SICS. In this way, PICS 1200 processes mailpiece information for BCS 1212, 1214, and 1216, using Common Sorter Software 1602. Additionally, SICS 1204 processes mailpiece information for BCS 1218 and 1220, using Common Sorter Software 1602. Regardless of the type of BCS, Common Sorter Software 1602 provides a common interface between the BCS and a PICS and/or SICS. Therefore, Common Sorter Software 1602 is infinitely compatible (with any BCS) and infinitely expandable (to any number of BCS devices). Notably, in one implementation, Common Sorter Software 1602 is software, but Common Sorter Software 1602 may also be hardware.

Figure 17 is a block diagram of one embodiment of a Bar Code Sorter (BCS) system using Common Sorter Software to connect to a PICS. BCS system 1700 includes BCS 1212 and Common Sorter Software 1602. Common Sorter Software 1602 provides an interface between BCS system 1700 and PICS 1710. Of course, one skilled in the art would understand that other BCS may be similarly configured or that

BCS 1212 may use Common Sorter Software 1602 to interface with a SICS rather than a PICS (i.e., PICS 1700).

Figure 18 illustrates various embodiments of Bar Code Sorters using Common Sorter Software to connect to a PICS/SICS such as the BCS systems shown in Figure 17. As illustrated in Figure 18, Common Sorter Software 1602 can be used with a Mail Processing Bar Code Sorter (MPBCS) 1802, a Downstream Bar Code Sorter (DBCS) 1804, a Carrier Sequence Bar Code Sorter (CSBCS) 1806, an Output Subsystem/Bar Code Sorter (OSS/BCS) 1808, or any other type of Bar Code Sorter.

Figures 19A-19C illustrate one embodiment for a process used by one embodiment of Common Sorter Software during the identification and processing of a mailpiece by any of the Bar Code Sorters (BCS), such as those shown in Figure 18. First, as shown in Figure 19A, after an operator 1900 has loaded the mailpieces into BCS 1212, operator 1900 enters a 'Start Run' command into BCS 1212. BCS 1212 then begins the process of attempting to identify and process the mailpieces. During this process, a connection with a PICS/SICS 1810 may become necessary. BCS 1212 uses Common Sorter Software 1602 to establish a connection with PICS/SICS 1810. As shown in Figure 19B, operator 1900 can constantly supervise the identification and processing of the mailpieces on BCS 1212 (i.e., throughout the "mail sort run"). During this period, BCS 1212 uses Common Sorter Software 1602 to communicate with PICS/SICS 1810 throughout the mail sort run. As shown in Figure 19C, once the mail sort run is complete, operator 1900 enters an 'End Run' command into BCS 1212, and

Common Sorter Software 1602 breaks the connection with PICS/SICS 1810 until the next mail sort run. One skilled in the art would be aware of alternative processes by which BCS 1212 could connect with PICS/SICS 1810 via Common Sorter Software 1602.

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F. Universal ID Tag Reader

As described above, as shown in Figures 12 and 13, a Bar Code Sorter (BCS) is used by ICS system 600 to read information from a mailpiece and to identify and process the mailpiece according to the information. As also described above, ICS system 600 uses special codes for the identification and processing of mail, namely, the POSTNET code (on the front of the mailpiece) and the identification code (on the back of the mailpiece). To read the identification code off the back of the mailpiece, RBCS 500 and ICS system 600 include special apparatus and processes, such as an ID Tag Reader (in RBCS 500) and an Universal ID Tag Reader (in ICS system 600).

Figure 20 is a block diagram of a Bar Code Sorter (BCS) consistent with one embodiment of the present invention, for example, as used by a RBCS, which includes, for example, an RBCS ID Tag Reader. BCS 1212 includes a Bar Code Sorting System 2002, Common Sorter Software 1602, and a RBCS ID Tag Reader 2000. As described above, RBCS 500 makes only limited use of an identification code, because identification files are temporary and may only be used locally. For this reason, RBCS ID Tag Reader 2000 is generally used with a single type of BCS, namely, the OSS/BCS 1808, as shown in Figure 18.

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Figure 21 is a block diagram of a Bar Code Sorter (BCS) consistent with one embodiment of the present invention, for example, as used by an ICS system, which includes, for example, a Universal ID Tag Reader. BCS 1212 in ICS system 600 includes Bar Code Sorting System 2002, Common Sorter Software 1602, and a Universal ID Tag Reader 2100. As described above, ICS system 600 makes widespread use of an identification code, and therefore, Universal ID Tag Reader 2100 has many applications. For example, Universal ID Tag Reader 2100 can be used on any type of BCS, including MPBCS 1802, DBCS 1804, CSBCS 1806, and OSS/BCS 1808, as shown in Figure 18.

Figure 22 is a block diagram of one embodiment of a Universal ID Tag Reader (UIDTR). UIDTR 2100 includes two main components: a Reader Head Assembly 2200 and a Reader Unit 2202 connected by a Fiber Optic Cable 2204. Notably, because Reader Head Assembly 2200 is separate from Reader Unit 2202, Reader Head Assembly 2200 may be placed in an assortment of different positions within ICS system 600, connected by Fiber Optic Cable 2204. In contrast to RBCS ID Tag Reader 2000, therefore, UIDTR 2100 has increased flexibility and usability in ICS system 600.

Figure 23 illustrates one embodiment of a UIDTR in greater detail, as shown in Figure 22. Reader Head Assembly 2200 includes an Infrared Receiver 2302 and a Lens 2304. Reader Unit 2202 includes a Reader Logic Unit 2306, a Light Source 2308, a Light Filter Unit 2310, a Signal Converter 2318, and a Port 2320. In this embodiment, Light Filter Unit 2310 includes a first Light Filter 2312, a second Light Filter 2314, and a

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As described above, therefore, it will be apparent to those skilled in the art that various modifications and variations can be made in the methods and apparatus of the present invention without departing from the spirit and scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention, provided they come within the scope of the appended claims and their equivalents. In this context, equivalents mean each and every implementation for carrying out the functions recited in the claims, even if not explicitly described herein.